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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/695,960	10/28/2003	Sergey A. Kuchinsky	SP02-173	8006

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EXAMINER	
CONNELLY CUSHWA, MICHELLE R	
ART UNIT	**PAPER NUMBER**
2874	

DATE MAILED: 12/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/695,960	KUCHINSKY ET AL.	
	Examiner	Art Unit	
	Michelle R. Connelly-Cushwa	2874	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-12 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-12 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 23 April 2004 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☒ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 0604,0105.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Priority

Acknowledgment is made of applicant's claim for foreign priority based on an application filed in Russia on November 11, 2002. It is noted, however, that applicant has not filed a certified copy of the Russian (2002130193) application as required by 35 U.S.C. 119(b).

Information Disclosure Statement

The prior art documents submitted by applicant in the Information Disclosure Statements filed on June 17, 2004 and January 10, 2005 have all been considered and made of record (note the attached copies of form PTO-1449).

Drawings

Twelve (12) sheets of formal drawings were filed on April 23, 2004 and have been accepted by the Examiner.

Specification

The abstract of the disclosure is objected to because the abstract contains more than 150 words. Correction is required. See MPEP § 608.01(b).

Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Objections

Claims 1, 4, 8 and 9 are objected to because of the following informalities:

Regarding claim 1; "so that" in line 11 of the claim should be deleted.

Regarding claim 4; "the said and second" in line 11 of the claim should be changed to –said first and second--, "so that" in line 12 of the claim should be deleted, and "so that" in line 15 of the claim should be deleted.

Regarding claim 8; "equal, less or greater than" in line 3 of the claim should be changed to –equal to, less than or greater than".

Regarding claim 9; "less, equal or greater that" in line 3 of the claim should be changed to –less than, equal to or greater than--.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1 and 3 are rejected under 35 U.S.C. 102(e) as being anticipated by Parker et al. (US 6,856,737 B1).

Applicant cannot rely upon foreign priority papers to overcome this rejection because a certified copy of the Russian (2002130193) application has not been filed and a translation of said papers has not been made of record in accordance with 37 CFR 1.55. See MPEP § 201.15.

Regarding claim 1; Parker et al. discloses a dispersion element (310; see Figure 31 for the dispersion element and Figures 1A and 1B for the optical waveguide structure that the dispersion element is formed in) for a laser pulse compression device adapted to compress a phase-modulated pulse (315), wherein

- the dispersion element is based on a planar photonic crystal structure (314) made as an one-dimensional (1D) periodic structure formed in a layer (313) of a high index material having a predetermined thickness and refractive index n_2,
- the high index material layer (13) is deposited on a substrate (11 in Figures 1A and 1B) with refractive index n_1, at $n_2 > n_1$,
- the periodic structure comprising a plurality of parallel grooves (314, see Figure 31) having a predetermined width and depth, made in the high index layer at equal distance from each other,
- wherein the pulse propagates in the dispersion element perpendicularly to the grooves, and
- a length of the dispersion element is defined to provide maximum compression of the phase-modulated pulse (see column 9, lines 25-58, and column 19, lines 19-38).

Regarding claim 3; The laws of nature, physical phenomena and abstract ideas are not patentable subject matter (see MPEP 2105 [R-1]). The equation set forth in claim 3 is a physical phenomena that can be derived from the known relationships of wave packet propagation in a medium (see Appendix A of Koroteev et al.,

"Compression of ultrashort light pulses in photonic crystals: when envelopes cease to be slow", January 1999, which sets forth the derivation of the equation claimed in claim 3; the Examiner notes that this reference was submitted by Applicant). Since claim 3 is solely directed towards this physical phenomena, claim 3 does not constitute patentable subject matter.

Claims 4, 5 and 7-12 are rejected under 35 U.S.C. 102(e) as being anticipated by Charlton et al. (US 6,901,194 B2).

Regarding claim 4; Charlton et al. discloses a dispersion element (see Figure 9a for the planar waveguide structure and Figures 44a and 44b for the photonic crystal structure) for a laser pulse compression device adapted to compress a phase-modulated pulse, wherein

- the dispersion element is based on a planar photonic crystal structure (the holes, 91, define the photonic crystal structure, as seen Figure 9a from the side, and in Figures 44a and 44b from the top) made as a two-dimensional periodic structure with predetermined period *a*, formed in a layer of high index material (core, 92) having a predetermined thickness and refractive index n_2,
- the high index material layer being deposited on a substrate (90) with a refractive index n_1, at $n_2 > n_1$, (see column 14, lines 10-29)
- sites of the 2D periodic structure having first holes (441) of a predetermined equal size, forming columns, and

- second holes (442, 443) of a predetermined equal size different from that of the first holes, forming a predetermined number of adjacent columns,
- wherein the sizes of the first and second holes and the refractive indices are defined to provide guided propagation of the phase-modulated pulse in single-mode operation along the columns of the second holes in the structure, and
- a length of the dispersion element is defined to provide maximum compression of the phase-modulated pulse (see column 30, lines 41-56).

Regarding claim 5; the 2D periodic structure is selected from a trigonal, rectangular or square periodic lattice (see column 31, lines 34-43).

Regarding claim 7; The laws of nature, physical phenomena and abstract ideas are not patentable subject matter (see MPEP 2105 [R-1]). The equation set forth in claim 7 is a physical phenomena that can be derived from the known relationships of wave packet propagation in a medium (see Appendix A of Koroteev et al., "Compression of ultrashort light pulses in photonic crystals: when envelopes cease to be slow", January 1999, which sets forth the derivation of the equation claimed in claim 7; the Examiner notes that this reference was submitted by Applicant). Since claim 7 is solely directed towards this physical phenomena, claim 7 does not constitute patentable subject matter.

Regarding claims 8 and 9; the depth of the first and second holes at the sites of the periodic structure must inherently be equal to, less than or greater than the thickness of the high index material, as no other possible relationship exists. In Figure 9a of Charlton et al., the depth is greater than the thickness of the high index material.

Regarding claim 10; distances between centers of the second holes and centers of the nearest first holes at the periodic structure sites can differ from the period of the structure (see Figures 44a and 44b).

Regarding claim 11; the first and second holes at the 2D periodic structure sites are in the shape of circular cylinders.

Regarding claim 12; the second holes form a single column in the 2D periodic structure, over which column the phase-modulated pulse accomplishes guided propagation in single-mode operation.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. (US 2003/0053733 A1) in view of Koroteev et al. ("Compression of ultrashort light pulses in photonic crystals: when envelopes cease to be slow", 1999, cited by Applicant).

Regarding claims 1-3; Wang et al. discloses a dispersion element (see Figures 3n-3p), wherein:

- the dispersion element is based on a planar photonic crystal structure (grating, 226) made as a one-dimensional (1D) periodic structure (see Figure 3m for a top down view showing grating 226 being formed as a one-dimensional structure);
- the planar photonic crystal structure (grating, 266) is formed in a layer of a high index material (214) having a predetermined thickness and refractive index n_2 (see paragraph [0056]);
- the high index material layer (214) is deposited on a substrate (202) with refractive index n_1, at $n_2 > n_1$,
- the periodic structure comprising a plurality of parallel grooves (226, see Figures 3l-3p) having a predetermined width and depth, made in the high index layer at equal distance from each other,
- wherein the pulse propagates in the dispersion element perpendicularly to the grooves (see Figures 4a and 4b); and
- wherein the periodic structure (226) is covered with a protective layer (228, 232; see paragraph [0062], where Wang et al. discloses that the layer 228 may be used as the cover layer 232 and may having a refractive index lower than the high index layer, 214) made of a material with a predetermined refractive index n_3 to provide mechanical strength and reduce scattering loss, where

$n_3 < n_2$ by a value providing guided propagation of the pulse in single-mode operation.

Wang et al. does not specifically state that the dispersion element is for a laser pulse compression device adapted to compress a phase-modulated pulse or that a length of the dispersion element is defined to provide maximum compression of the phase-modulated pulse.

Koroteev et al. teaches that one-dimensional photonic band gap (PBG) structures may advantageously be used to compress laser pulses (see the abstract, the second full paragraph on page 192, and Appendix A). In Appendix A, Koroteev et al. further teaches that maximum compression of the phase-modulated pulse is obtained when the length of the dispersion element (the one-dimensional PBG structure) is defined by the physical relationship derived from known properties of wave packet propagation (see equations A1.10 and A1.11, it is noted that equation A1.11 is the same as that claimed in claim 3 of the present application).

Given the suggestion of Koroteev et al. to use a one-dimensional PBG structure to maximally compress laser pulses by forming the PBG structure with a length given by equation A1.11, and the teachings of Wang et al. directed to the production of one dimensional optical gratings, one of ordinary skill in the art would have found it obvious to form the one-dimensional PBG structure (grating, 226) disclosed by Wang et al. to obtain maximal compression of laser pulses.

Claims 4, 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. (US 2003/0053733 A1) in view of Koroteev et al. ("Compression of

ultrashort light pulses in photonic crystals: when envelopes cease to be slow", 1999, cited by Applicant) and Charlton et al. (US 6,901,194 B2).

Regarding claims 4, 6 and 7; Wang et al. discloses a dispersion element (see Figures 3n-3p), wherein:

- the dispersion element is based on a planar photonic crystal structure (grating, 226) made as a two-dimensional periodic structure (see paragraph [0096] in which Wang et al. discloses that the gratings may be multi-dimensional) with a predetermined period *a*,
- the planar photonic crystal structure (grating, 266) is formed in a layer of a high index material (214) having a predetermined thickness and refractive index n_2 (see paragraph [0056]);
- the high index material layer (214) is deposited on a substrate (202) with refractive index n_1, at $n_2 > n_1$, and
- wherein the periodic structure (226) is covered with a protective layer (228, 232; see paragraph [0062], where Wang et al. discloses that the layer 228 may be used as the cover layer 232 and may having a refractive index lower than the high index layer, 214) made of a material with a predetermined refractive index n_3 to provide mechanical strength and reduce scattering loss.

Wang et al. does not specifically state that the dispersion element is for a laser pulse compression device adapted to compress a phase-modulated pulse; that a length

of the dispersion element is defined to provide maximum compression of the phase-modulated pulse; or that sites of the 2D periodic structure have first holes of a predetermined equal size, forming columns, and second holes of a predetermined equal size different from that of the first holes, forming a predetermined number of adjacent columns, wherein the sizes of the first and second holes and the refractive indices are defined so to provide guided propagation of the phase-modulated pulse in single-mode operation along the columns of the second holes in the structure.

Charlton et al. discloses a dispersion element (see Figure 9a for the planar waveguide structure and Figures 44a and 44b for the photonic crystal structure) for a laser pulse compression device adapted to compress a phase-modulated pulse, wherein

- the dispersion element is based on a planar photonic crystal structure (the holes, 91, defined the photonic crystal structure, as seen Figure 9a from the side and Figures 44a and 44b from the top) made as a two-dimensional periodic structure with predetermined period *a*, formed in a layer of high index material (core, 92) having a predetermined thickness and refractive index n_2,
- the high index material layer being deposited on a substrate (90) with a refractive index n_1, at $n_2 > n_1$, (see column 14, lines 10-29)
- sites of the 2D periodic structure having first holes (441) of a predetermined equal size, forming columns, and

- second holes (442, 443) of a predetermined equal size different from that of the first holes, forming a predetermined number of adjacent columns,
- wherein the sizes of the first and second holes and the refractive indices are defined to provide guided propagation of the phase-modulated pulse in single-mode operation along the columns of the second holes in the structure, and

Koroteev et al. teaches that band gap (PBG) structures may advantageously be used to compress laser pulses (see the abstract, the second full paragraph on page 192, and Appendix A). In Appendix A, Koroteev et al. further teaches that maximum compression of the phase-modulated pulse is obtained when the length of the dispersion element is defined by the physical relationship derived from known properties of wave packet propagation (see equations A1.10 and A1.11, it is noted that equation A1.11 is the same as that claimed in claim 7 of the present application).

Given the suggestion of Charlton et al. to use a two-dimensional photonic crystal having holes of two different sizes, as discussed above, the suggestion of Koroteev et al. to use a PBG structure to maximally compress laser pulses by forming the PBG structure with a length given by equation A1.11, and the teachings of Wang et al. directed to the production of multi-dimensional optical gratings, one of ordinary skill in the art would have found it obvious to form the multi-dimensional PBG structure disclosed by Wang et al. to obtain maximal compression of laser pulses, while providing

the holes of two different sizes, as taught by Charlton et al., to compensate for edge effects and to provide other optical transmission characteristics as desired.

Conclusion

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Any inquiry concerning the merits of this communication should be directed to Examiner Michelle R. Connelly-Cushwa at telephone number (571) 272-2345. The examiner can normally be reached 9:00 AM to 7:00 PM, Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney B. Bovernick can be reached on (571) 272-2344. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general or clerical nature should be directed to the Technology Center 2800 receptionist at telephone number (571) 272-1562.

Michelle R. Connelly-Cushwa

Michelle R. Connelly-Cushwa
Patent Examiner
December 7, 2005

12/7/05